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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/985,870	11/06/2001	Robert J. Small	60937-114-US	4477

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EXAMINER

ALANKO, ANITA KAREN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 10/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/985,870	SMALL ET AL.	
	Examiner	Art Unit	
	Anita K Alanko	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 7/23/04 amdt.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 9-16 and 48-66 is/are pending in the application.
- 4a) Of the above claim(s) 13 and 48-57 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 9-12, 14-16 and 58-66 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 9, 11-16, 48-56 and 65 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The new range of pH 6-9 is not described in the original disclosure such that it is envisaged by the original disclosure. Page 8, lines 10-11 describes a range of pH 4-12, and page 58, line 18 describes a range of pH 7-9. There are also multiple examples of a wide range of pH values of 1.5, 2, 2.5, 3.6 and 6 (page 58-page 59, line 2). Therefore, the range of 6-9 is new matter.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9-12, 14-16, 58-60, 62-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Streinz et al (US 5,993,686) and Scherber et al (US 5,858,813).

Streinz discloses a method for chemical mechanical polishing of tungsten (col.3, lines 26-32) comprising:

providing a semiconductor substrate comprising on one face tungsten and a dielectric material (col.3, lines 26-32);

providing a chemical mechanical polishing composition comprising

between about 0.5% and about 10% periodic acid (col.3, lines 62-63; col.4, line 10),

between about 0.1% and about 10 % of a secondary oxidizer, malonic acid (col.7, lines 37, 47-48), and

a pH adjusting compound to adjust the pH of the composition, wherein the pH of the composition is about 4-5 (col. 5, lines 47-53);

movably contacting the substrate face with a pad exerting pressure on the substrate and with the composition under conditions that tungsten is removed at a rate different than the removal of the dielectric material.

Streinz fails to disclose the pressure used during the chemical mechanical polishing.

Scherber teaches that a useful pressure during CMP of tungsten (col.10, line 19) with a composition comprising periodic acid (col.5, line 8) and malonic acid (col.5, line 50), which is similar to the composition of Streinz, includes 5 psi (see Tables). The pressure is a result effective variable in that the pressure applied effects the rate of mechanical removal.

Therefore, it would have been obvious to one with ordinary skill in the art to polish at 5 psi, which is within the range cited, in the method of Streinz because Scherber teaches that this is a useful pressure for CMP. It would have been still further obvious to vary the pressure to the

range cited in the modified method of Streinz because the pressure appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

As to amended claim 9 and claims 64-66, Streinz fails to disclose a pH of 6-9 or 7-9. Streinz discloses that a pH of greater than five may be desirable when polishing other materials such as copper (col.5, lines 38-40). Examiner takes official notice that polishing of a metal plugs with Ti-W barrier layers is well known. It would have been obvious to one with ordinary skill in the art to vary the pH to the cited range in the modified method of Streinz because Streinz discloses that the pH may be increased when polishing other materials such as copper. One common structure is to polish a metal plug, for which it would be obvious to keep the same composition to polish the barrier layer, comprising at least some portion of tungsten, in order to save process steps by not changing the polishing material.

As to claim 11, Streinz discloses that mixtures of oxidizing agents, including periodic acid and potassium iodate, may be used in the composition (col.3, line 57-col.4, line 4).

As to claim 12, Streinz discloses that NH_4HF_2 may be added to the composition (col.4, line 47).

As to claim 14, Streinz discloses that combinations of organic acids (col.7, lines 42-44) including lactic acid, succinic acid, tartaric acid, citric acid, oxalic acid or salts thereof (col.7, lines 33-42) may be used.

As to claims 15-16, the parameters of claim 15 overlap with the base claim. In general, the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, was held to be not patentably distinguish the processes. *Ex parte Rubin* 128 USPQ 440 (PTO BdPatApp 1959).

As to claims 58-59, see the rejection of claim 14.

As to claim 60, Streinz discloses that the composition comprises an abrasive (col.5, lines 54-55).

As to claims 62-63, see the rejection of claims 15-16.

Claims 9-12, 14-16, 58-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Streinz et al (US 5,993,686) and Scherber et al (US 5,858,813), and further in view of Nakagawa (US 5,700,389).

The discussion of modified Streinz from above is repeated here.

As to claim 61, Streinz does not disclose to add imidazole to the composition. Nakagawa teaches that imidazole is a useful additive to etching solutions to increase the etch rate and prevent rust (col.2, lines 11-16). It would have been obvious to one with ordinary skill in the art to add imidazole to the composition of Streinz because Nakagawa teaches that it is a useful additive to etching solutions to increase the etch rate and prevent rust.

Response to Arguments

Applicant's arguments filed 7/23/04 have been fully considered but they are not persuasive.

Applicant argues that Streinz does not suggest a pH of 6-9. However, Streinz does suggest that the pH can be increased (see rejection above), and since the claim has open "comprising" language – it is open to polishing several other materials, which may comprise tungsten, such as Ti-W.

It is noted that Scherber is not relied upon to teach the pH.

Applicant's arguments about the large number of combinations of elements in Streinz and Scherber is acknowledged. However, each application is examined on a case-by-case basis, and the Streinz reference is specific about the various additives and is clear about adding various additives such as those cited in the claims. In addition, of the multiple organic acids that may be added (col.7, lines 33-42) – is there an unexpected result from choosing malonic acid compared to the other organic acids?

Applicant's arguments about Nakagawa are not persuasive. Nakagawa teaches to add imidazole to etching solutions, which, broadly interpreted, a polishing solution is.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Anita K. Alanko
Anita K Alanko
Primary Examiner
Art Unit 1765